UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,755	04/15/2004	Lim Peng Soon	NSC1P296/P05887	1216

22434 7590 01/14/2005

BEYER WEAVER & THOMAS LLP
P.O. BOX 70250
OAKLAND, CA 94612-0250

EXAMINER	
OWENS, DOUGLAS W	
ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 01/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/826,755	SOON ET AL.	
	Examiner	Art Unit	
	Douglas W. Owens	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9-12 and 14-19* is/are rejected.

7)☒ Claim(s) *8,13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 April 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/15/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the embodiment "wherein the first contact point is a bond pad of a first semiconductor die and the second contact point is a bond pad of a second semiconductor die, which is stacked on top of the first semiconductor die", as required in claim 7 must be shown or the feature(s) canceled from the claim(s). Also, the embodiment "wherein the two wires cross each other without touching each other", as required in claim 8 must be shown or the feature(s) canceled from the claim. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure

number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities: in lines 15 – 17 of page 1, "106" should be replaced with --108--, and "108" should be replaced with --110--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The scope of the claim is vague, since it is not clear what is meant by the "heat affect zone". The zone affected by the heat and how or what is affected by the heat has not been defined in the claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1 and 3 – 5 are rejected under 35 U.S.C. 102(a) as being anticipated by admitted prior art.

Regarding claim 1, admitted prior art (Fig. 1) teaches a method for attaching a wire in a semiconductor device comprising:

feeding a wire through a capillary (106);

attaching a first end of the wire onto a first contact point (page 1, lines 25 and 26);

raising the capillary straight up from the first contact point while the wire (104) continues to feed out of the capillary (Page 1, lines 30 and 31);

moving the capillary towards a second contact point whereby the wire is fed out of the capillary is drawn towards the second contact point (page 2, lines 1 and 2); and

attaching the wire to the second contact point wherein a segment of the wire near the first contact point forms a wire loop that has a small loop height.

Regarding claim 3, admitted prior art teach a method, wherein the operation of attaching the first end of the wire comprises ball bonding the wire to the first contact point and wherein the operation of attaching the wire to the second contact point comprises stitch bonding the wire to the second contact point.

Regarding claim 4, admitted prior art teaches a method, wherein a segment of the wire that is proximate to the ball bonded portion of the wire has a curvature that only curves towards the second contact point.

Regarding claim 5, admitted prior art teaches a method, wherein the first contact point is a bond pad (See Fig. 2) on a semiconductor die (100) and the second contact point is on a contact lead (102).

8. Claims 1 – 5, 11, 14 – 16 and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6,564,115 to Kinnaird.

Regarding claims 1, 2 and 15, Kinnaird teaches a method for attaching a wire in a semiconductor device comprising (Fig. 3, for example):

feeding a wire through a capillary (301);

attaching a first end of the wire onto a first contact point (Col. 4, lines 52 – 54);

raising the capillary straight up from the first contact point wherein the wire continues to feed out of the capillary;

moving the capillary in a lateral direction that is only towards a second contact point (path 303) whereby the wire that is fed out of the capillary is drawn towards the second contact point (305); and

attaching the wire to the second contact point wherein a segment of the wire near the first contact point forms a wire loop that has a small loop height.

Regarding claims 3 and 16, Kinnaird teaches a method, wherein the operation of attaching the first end of the wire comprises ball bonding the wire to the first contact point (Col. 4, lines 49 – 54) and wherein the operation of attaching the wire to the second contact point comprises stitch bonding the wire to the second contact point (Col. 5, lines 4 – 11).

Regarding claim 4, Kinnaird teaches a method, wherein a segment of the wire that is proximate to the ball bonded portion of the wire has a curvature that only curves towards the second contact point.

Regarding claim 5, Kinnaird teaches a method, wherein the first contact point is a bond pad on a semiconductor die (201) and the second contact point is on a contact lead (204).

Regarding claims 11 and 19, Kinnaird teaches a method, further comprising:

Controlling the capillary such that the capillary attaches the wire to the second contact point at a height that is within 3 mils of the height of the first contact point, wherein the height is understood to be the distance above the contact surface. Kinnaird teaches that the diameter of the ball is in the range of 1.2 to 1.6 wire diameters (Col. 4, lines 50 – 51) and the wire diameter is in the range of 18 to 33 micro meters (Col. 4,

lines 35 – 37). Although the ball is compressed upon contacting the chip (Col. 4, lines 45 – 54), the diameter, or height, of the uncompressed ball is within the range of 3 mils.

Regarding claim 14, Kinnaird teaches a method, further comprising:

repeating the steps in order to attach multiple wires between respective contact points such that each of the wires have approximately the same loop height (Figs. 2 & 7A).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art as applied to claim 1 above, and further in view of US Patent Application Publication No. 2004/0115918 to Kanda et al.

Admitted prior art does not teach a method, wherein the first contact point is on a contact lead and the second contact point is a bond pad of a semiconductor die. Kanda et al. teach a method (Figs. 2A – 2C), wherein the first contact point is on a contact lead (6) and the second contact point is a bond pad (7) of a semiconductor die. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Kanda et al. into the method of the admitted prior art, since it is desirable to produce a small loop height (Compare Figs. 2C and 3C of Kanda et al.) Additionally, It has been held that the selection of any order of process steps is prima facie obvious in the absence of

new or unexpected results. See *Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959) (Prior art reference disclosing a process of making a laminated sheet wherein a base sheet is first coated with a metallic film and thereafter impregnated with a thermosetting material was held to render prima facie obvious claims directed to a process of making a laminated sheet by reversing the order of the prior art process steps.). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kinnaird as applied to claim 1 above, and further in view of Kanda et al.

Kinnaird does not teach a method, wherein the first contact point is on a contact lead and the second contact point is a bond pad of a semiconductor die. Kanda et al. teach a method (Figs. 2A – 2C), wherein the first contact point is on a contact lead (6) and the second contact point is a bond pad (7) of a semiconductor die. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Kanda et al. into the method of Kinnaird, since it is desirable to produce a small loop height (Compare Figs. 2C and 3C of Kanda et al.) Additionally, It has been held that the selection of any order of process steps is prima facie obvious in the absence of new or unexpected results. See *Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959) (Prior art reference disclosing a process of making a laminated sheet wherein a base sheet is first coated with a metallic film and thereafter impregnated with a thermosetting material was held to render prima facie obvious claims directed to a process of making a laminated sheet by reversing the order of the prior art process steps.). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

12. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art as applied to claim 1 above, and further in view of US Patent Application Publication No. 2003/0042621 to Chen et al.

Admitted prior art does not teach a method, wherein the first contact point is a bond pad of a first semiconductor die and the second contact point is a bond pad of a second semiconductor die, which is stacked on top of the first semiconductor die. Chen et al. teach a method (Fig. 4), wherein the first contact point is a bond pad (148) of a first semiconductor die and the second contact point is a bond pad (154) of a second semiconductor die, which is stacked on top of the first semiconductor die. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Chen et al. into the method taught by admitted prior art, since it is desirable to add functionality to semiconductor devices.

13. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kinnaird as applied to claim 1 above, and further in view of Chen et al.

Kinnaird does not teach a method, wherein the first contact point is a bond pad of a first semiconductor die and the second contact point is a bond pad of a second semiconductor die, which is stacked on top of the first semiconductor die. Chen et al. teach a method (Fig. 4), wherein the first contact point is a bond pad (148) of a first semiconductor die and the second contact point is a bond pad (154) of a second semiconductor die, which is stacked on top of the first semiconductor die. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Chen et al.

into the method taught by Kinnaird, since it is desirable to add functionality to semiconductor devices.

14. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art as applied to claim 1 above, and further in view of US Patent Application Publication no. 2001/0054759 to Nishiura.

Regarding claim 9, admitted prior art does not teach a method further comprising:

Repeating the steps in order to attach multiple wires between respective contact points such that at least two bonded wires cross each other without touching. Nishiura teaches a method, wherein multiple wires are attached between contact points such that the bonded wires cross each other without touching (Figs. 2A, 2B, 4A, 4B, 6A and 6B). It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Nishiura into the method taught by the admitted prior art, since it is desirable to add functionality to devices, while avoiding shorting bond wires together.

Regarding claim 10, admitted prior art does not teach a method, wherein the capillary rises upwards to a first height while attaching a first wire and a second height while attaching a second wire such that the second wire crosses the first wire at a height that is higher than that of the first wire. Nishiura teaches a method, wherein the second wire crosses the first wire at a height that is higher than the first wire. If one of ordinary skill had incorporated the teaching of Nishiura into the method of the admitted prior art, the only way to accomplish the structure would have been to have the capillary rise to a second height when attaching the second wire. It would have been obvious to

incorporate the teaching of Nishiura into the method of the admitted prior art for reasons discussed above.

15. Claims 9, 10, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinnaird as applied to claim 1 above, and further in view of Nishiura.

Regarding claims 9 and 17, Kinnaird does not teach a method further comprising:

Repeating the steps in order to attach multiple wires between respective contact points such that at least two bonded wires cross each other without touching. Nishiura teaches a method, wherein multiple wires are attached between contact points such that the bonded wires cross each other without touching (Figs. 2A, 2B, 4A, 4B, 6A and 6B). It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Nishiura into the method taught by Kinnaird, since it is desirable to add functionality to devices, while avoiding shorting bond wires together.

Regarding claims 10 and 18, Kinnaird does not teach a method, wherein the capillary rises upwards to a first height while attaching a first wire and a second height while attaching a second wire such that the second wire crosses the first wire at a height that is higher than that of the first wire. Nishiura teaches a method, wherein the second wire crosses the first wire at a height that is higher than the first wire. If one of ordinary skill had incorporated the teaching of Nishiura into the method taught by Kinnaird, the only way to accomplish the structure would have been to have the capillary rise to a second height when attaching the second wire. It would have been obvious to incorporate the teaching of Nishiura into the method taught by Kinnaird for reasons discussed above.

Allowable Subject Matter

16. Claims 8 and 13 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W. Owens whose telephone number is 571-272-1662. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Douglas W Owens
Examiner
Art Unit 2811